

CLAIMS

✓ 1. A cathode sub-assembly for an ion source comprising:  
an indirectly heated cathode; and  
a support rod fixedly attached to the indirectly heated cathode for supporting the  
5 cathode within an arc chamber of the ion source.

✓ 2. The cathode sub-assembly as defined in claim 1 wherein the support rod is attached  
to a surface of the cathode facing away from the arc chamber.

10 ✓ 3. The cathode sub-assembly as defined in claim 2 wherein the cathode is in the shape  
of a disk.

✓ 4. The cathode sub-assembly as defined in claim 3 wherein the support rod is fixedly  
attached at or near the center of the cathode, along an axis of the cathode.

15 ✓ 5. The cathode sub-assembly as defined in claim 4 wherein the support rod is in the  
shape of a cylinder and the diameter of the cathode is larger than a diameter of the support  
rod.

20 ✓ 6. The cathode sub-assembly as defined in claim 5 wherein the diameter of the  
cathode is at least four times larger than the diameter of the support rod.

7. The cathode sub-assembly as defined in claim 5 further comprising a spring loaded  
clamp for holding the support rod.

25 ✓ 8. The cathode sub-assembly as defined in claim 1 wherein the support rod  
mechanically supports and conducts electrical energy to the cathode.

*Sub A* > 30 ✓ 9. A cathode assembly for use in an indirectly heated cathode ion source which  
includes an arc chamber housing that defines an arc chamber, comprising:  
a cathode sub-assembly, including a cathode and a support rod fixedly mounted  
thereto; and

a filament for emitting electrons, that is positioned outside the arc chamber in close proximity to the support rod of the cathode sub-assembly; and

a cathode insulator for electrically and thermally isolating the cathode from an arc chamber housing, that is disposed around the cathode of the cathode sub-assembly.

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✓ 10. The cathode sub-assembly as defined in claim 9 further comprising a filament disposed around the support rod in close proximity to the cathode and isolated from a plasma in the arc chamber.

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11. The cathode sub-assembly as defined in claim 9 further comprising a filament disposed around the support rod in close proximity to the cathode and isolated from a plasma in the arc chamber, wherein the filament is fabricated of an electrically conductive material and includes an arc-shaped turn having an inside diameter greater than or equal to the diameter of the support rod.

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12. The cathode sub-assembly as defined in claim 9 further comprising a filament disposed around the support rod in close proximity to the cathode and isolated from a plasma in the arc chamber, wherein the filament is fabricated of an electrically conductive material and includes an arc-shaped turn having an inside diameter greater than or equal to the diameter of the support rod, and wherein a cross-sectional area of the filament varies along a length of the filament, and is smallest along the arc-shaped turn.

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13. The cathode assembly of claim 9 wherein said cathode insulator includes an opening having a diameter that is larger than or equal to the diameter of the cathode.

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✓ 14. The cathode assembly as defined in claim 13 wherein a vacuum gap is provided between the cathode insulator and the cathode to limit thermal conduction.

15. The cathode insulator of claim 13 wherein said cathode insulator has a generally tubular shape with a sidewall and includes a flange, for shielding the sidewall of the cathode insulator from a plasma in the arc chamber.

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16. The cathode insulator of claim 15 wherein said flange is provided with a groove on a side of the flange facing away from the plasma, for increasing a path length between the cathode and the arc chamber housing.

5        ✓ 17. A method for supporting and indirectly heating a cathode of an ion source comprising steps of:

supporting the cathode by a rod fixedly attached to the cathode; and  
bombarding the cathode with electrons.

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18. A cathode assembly for an ion source comprising:

a cathode;  
a support rod fixedly attached to the cathode; and  
a cathode insulator for electrically and thermally isolating the cathode from an arc chamber housing; and  
15        an indirect heating means for indirectly heating the cathode.